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NOTES ON THE ONTOGENY OF THE GENITAL TUBES IN COLEOPTERA.

By F. MUIR,

Hawaiian Sugar-Planters Association Experiment Station,
Honolulu, Hawaii.

In 1912 Dr. Sharp and I, after an extensive anatomical study of the male genital tube of Coleoptera, published ¹ the conclusions we arrived at, along with details of this organ in most of the families of Coleoptera. Upon my return to Honolulu I started a series of observations on the development of this organ to see if the conclusions we had arrived at by anatomical studies could be sustained. Field work in the Orient took me away from Honolulu before I could finish this work and my notes remained unpublished; similar reasons prevent me from completing the work now, but as my observations may throw some light upon this subject I publish the following résumé.

My observations were made upon *Rhabdoenemis obscurus*, *Carpophilus humeralis* and *Cælophora inæqualis*, and a few on *Opatrum seriatum*. Unfortunately the first three all have "ring-shape" tegmina and are highly specialized forms, and the observations on *Opatrum* were not extensive enough to demonstrate the development of the tegmen. It is to be hoped that a detailed study of the ontogeny of a more generalized "trilobe" form will be made.

In the early stages of the male pupa of these species the testes are attached, each by a fine *testicular thread* to a small mass of cells *between* the ninth and tenth sternites (1a). This cellular mass forms an invagination (*genital invagination*) of the hypoderm of the developing imago; it increases in size and the bottom grows

¹ Trans. Ent. Soc., Lond., 1912; III, 477-642; figs. 1-239.

into the cavity, forming the *pregenital tube* (tg.+mt.+is.); at the apex of this tube, where the testicular threads are attached, another invagination takes place forming the ejaculatory duct (1b, 2). At the base of the pregenital tube of *R. obscurus* a fold arises which develops into the tegmen (1c); the tube lengthens by the apex growing into the cavity of the invagination and the base through the tegminal fold, into the body cavity (1d). A constriction round the middle of the pregenital tube divides it into two portions, the apical portion forming the internal sac and the basal the median lobe (3). As the internal sac increases in length it lies crumpled up within the invagination and is not withdrawn into the median lobe until after the imago is fully developed (4). In Lamellicorns and Staphylinids I have also observed that the internal sac is not withdrawn into the median lobe until the imago is fully developed.

From each side of the base of the median lobe a long invagination of the ectoderm takes place, these become highly chitinized and form the median struts: at first broad, more like those in *Cerambycidae*, they afterwards become slender. From a medio-ventral point on the tegminal fold arises a larger invagination which also becomes highly chitinized (along with the tegminal fold) and forms the tegminal strut (1e). From a point on the anterior wall of the genital invagination a slender invagination takes place, grows round to the right side, becomes chitinized and forms the spiculum (3, 4, sp.). The basal portion of the walls of the genital invagination becomes chitinized (4a) and, together with the membranous apical portion (4b) attached to the tegmen, form the second connecting membrane. If the cœdeagus be dissected out of a half or three fourths developed pupa and placed in acetic acid, so as to cause the cells to swell up, the true nature of the folds and invaginations forming the tegmen, tegminal and median struts and spiculum will be observable.

Lateral lobes are outgrowths from the tegminal fold. In *Carpophilus humeralis* they at first form two large rounded lobes, eventually growing to the pointed processes found in the adult. (5). In the same insect the internal sac, which is exceedingly long, first grows to the mouth of the genital invagination and then grows into the body cavity; the flagellum at first is a short thick process (5 fg) and lengthens with the internal sac.

In *Calophora inaequalis* the lateral lobes are at first flat, broad processes (6); the median dorsal "cap piece" (7 tg) appears to arise by an outgrowth from the tegminal fold beneath the lateral lobes, the latter eventually attaining a more dorsal position and become long and slender. As the median lobe lengthens it grows into the body cavity, but as its base is attached to the median strut it assumes the curved shape common to this family (7).

The armatures on the internal sac arise as folds and chitinizations, and sometimes are continued on to the median lobe; this is not strange as the median lobe and sac are all one at first.

These observations of the ontogeny of the genitalia support the conclusions Dr. Sharp and I came to after extensive anatomical studies, that this organ is a median tube with folds and chitinizations, and lend no support to the theory that one or more sternites go to its composition.

In the more generalized forms of Coleoptera (8) there are nine distinct tergites and nine distinct sternites. Below the last tergite lies the anal tube (9 an) which in some forms is well developed and chitinized, and is considered by some to represent the tenth tergite and sternite. Berlese even makes out another beyond this in *Lucanus cervinus* and calls it the eleventh tergite. In *Enarsus bakewelli* there is a distinct plate between the anus and the oedeagus and in *Cupes clathratus* there is a large pair of appendages which would indicate segmental appendages; but in the vast majority the anal tube is membranous and not differentiated from the second connecting membrane. In more specialized forms the ninth sternite is reduced and sometimes forms a T-, Y- or V-shaped sclerite. In *R. obscurus* nothing is left of it, unless it be the spicule.

In *Anomala orientalis* and allied species the large tambour tegmen is ventral during development, and so has the appearance of being a sternite; in this case it would have to be the tenth sternite and the median orifice would be posterior to it, but we see by the ontogeny that this lies between the ninth and tenth. The tegmen in *Edemeridae* is the most sternite-like one of all that I have examined and a knowledge of its development would be of interest.

The probability of a tergite taking any part in the formation of the oedeagus appears to me to be so remote that, if it were not for the fact that such a theory is widely maintained, I would not confute it.

In insects the anus is the direct development of the proctodæum, and how a tergite can take part in the formation of a tube on the ventral surface, without the position of the anus shifting during ontogeny, I cannot understand. The onus of evidence lies with those who claim such a development.

Dr. Hopkins in a recent work¹ remarks:

"It is quite evident that element *a* [median lobe²] represents the tenth sternite, *b* [armature on internal sac] the tenth tergite, *c* [tegmen] the ninth tergite, and *d* [spicule] the ninth sternite, while *b1* and *b2* [apical armature on internal sac] appear to represent elements of either the tenth tergites or of both the tenth tergite and tenth sternite. It might also be well to consider in future investigations the possibility of their representing the tenth pleurites or even an additional eleventh segment."

To me none of these statements are at all evident, and some are quite illogical; all available evidence is against them. The most important part of the organ, the internal sac, is not accounted for, perhaps because it is membranous. Chitinization is often looked upon as the important thing whilst the membrane is disregarded, whereas the latter is the important part. This is certainly so in the œdeagus of the vast majority of Coleoptera, the internal sac being the chief organ and the armature (end plates) but secondary.

As before remarked the stenazygos is formed by the invagination of the spot to which the threads from the testes are attached. The zygos is supposed to be of mesodermic origin, but it appears to develop continuously from the stenazygos.

In the female pupa of *R. obscura* the genital invagination takes place down the middle of the ninth sternite. The "ovipositor" is composed of modified body segments or of sternites, the genital styles being developed directly from the appendages of the ninth segment of the larva and pupa. The ovary is at first composed of two small cells which lengthen out and meet together at one end; these are in touch with one another and the end of the oviduct for some time before the walls break down and communication between the two ovaries and the duct is established. The oviduct appears to be a continuous development of the azygos or uterus and there-

¹ Preliminary Classification of the Superfamily Scolytoidea. U. S. Dept. Agr., Tech. Ser. 17, Pt. II, 1915.

² Explanatory remarks in brackets are by the present writer.

fore of ectodermic origin. The spermatheca arises from the azygos or uterus.

Conclusions.

My studies of the ontogeny and anatomy of the male genital tube in Coleoptera lead me to the following conclusions: those relating to the internal sac naturally do not apply to those forms where it is not differentiated.

The œdeagus arises as a tubular organ at the base of an intersegmental invagination between the ninth and tenth sternites. By transverse folds it differentiates into three sections: a basal or outer section (tegmen), a median segment (median lobe) more or less surrounded by the tegmen, and a distal segment (internal sac), which is generally invaginated within the median lobe. Cases occur in different families in which each of these segments is reduced or absent.

There is no evidence that one or more sternites take part in the composition of the œdeagus; the only sternite that could do so is the tenth, but it is more likely that this becomes dechitinized (except in *Enarsus*) and incorporated into the anal tube or the second connecting membrane.

No tergite takes part in the composition of the œdeagus.

Where the ninth sternite is well developed there is no spicule, but it often has a pair of projections, or a single projection, from its base, and the latter may be represented by the spicule in such forms that have no ninth sternite.

Figures 1a-e are diagrammatic, figures 2-9 are all drawn from specimens with the aid of a camera lucida.

EXPLANATIONS OF FIGURES.

Fig. 1a to e. Diagrammatic representation of the development of the male œdeagus.

Fig. 2. Early stage of genitalia of ♂ pupa of *R. obscura*.

Fig. 3. Later stage of same.

Fig. 4. Nearly mature stage of same.

Fig. 5. Early stage of genitalia of ♂ pupa of *Carpophilus humeralis*.

Fig. 6. Early stage of genitalia of ♂ pupa of *Celophora inæqualis*.

Fig. 7. Later stage of same.

Fig. 8. Lateral view of abdomen of *Dermestes vulpinus*.

Fig. 9. Ninth segment of same.

EXPLANATION OF LETTERING.

- 1-9 = tergites.
I-X = sternites.
9pl = ninth pleuron.
an = anus.
bp = basal-piece.
cm1 = first connecting membrane.
cm2 = second connecting membrane.
ej = ejaculatory duct.
fg = flagellum.
g = accessory glands.
gi = genital invagination.
is = internal sac.
ll = lateral lobe.
ml = median lobe.
mo = median orifice.
ms = median strut.
pt = undifferentiated tg. ml. and is.
sp = spiculum.
te = testes.
tec = testicular cord.
tg = tegmen (pregenital tube = tg+ml+is).
tgs = tegminal strut.
vd = seminal ducts.
vs = seminal vesicle.

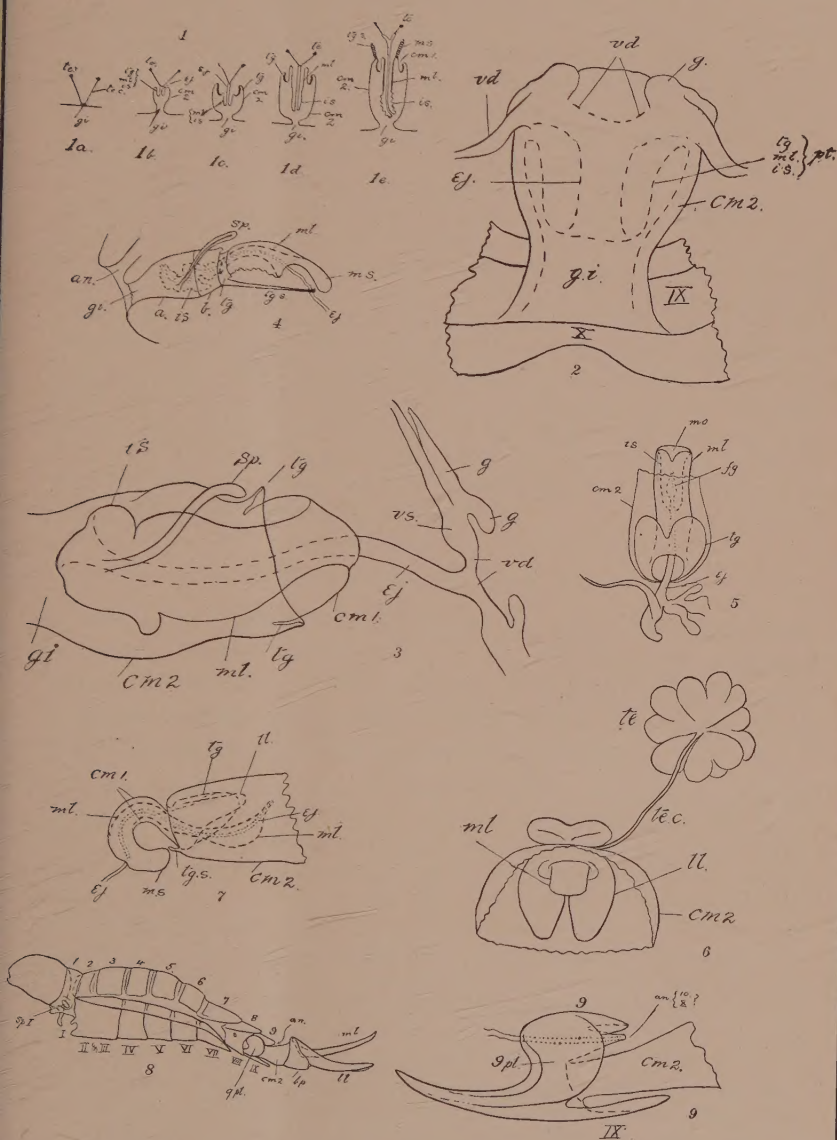
NEW SOUTH AMERICAN GALL MIDGES.

By E. P. FELT,
Albany, New York.

The following accounts are based mostly on a small collection generously donated to the State Museum by C. P. Alexander of Cornell University. The South American gall midge fauna, as shown by fragmental studies here and there, is extremely interesting. It is sincerely hoped that collectors working in that part of the world will, in the future, be able to give more attention to these midges.

Porricondyla parrishi sp. nov.

The species described below was collected by H. S. Parrish, December 27, 1912, at Bartica, British Guiana, and donated to the state collections by C. P. Alexander.

MUIR—*Genital tube of Coleoptera.*

Male: Length, 1.5 mm. Antennæ probably one-half longer than the body, sparsely haired, dark straw; at least 11, and probably 16 segments, the fifth with a stem one-half longer than the cylindrical basal enlargement, which latter has a length one-half greater than its diameter, a thick subbasal whorl of short, stout setæ and a sparse subapical whorl of long, slender setæ; low circumfili occur at the basal third and apically; terminal segment wanting. Palpi; first segment subquadrate, with a length nearly twice its diameter, the second a little longer, more slender, the third about two and one-half times the length of the second, irregular, the fourth one-half longer than the third, more slender. Mesonotum reddish brown. Scutellum and postscutellum yellowish white. Abdomen rather sparsely haired, mostly dark brown dorsally, the pleuræ, venter and enlarged genitalia yellowish. Wings hyaline, the two branches of the fifth vein very short and approaching the condition found in Colpodia. Halteres mostly yellowish transparent. Coxæ pale yellowish, the legs mostly pale straw; claws stout, evenly curved, unidentate, the pulvilli about two-thirds the length of the claws. Genitalia; basal clasp segment rather short, broadly and triangularly oval; terminal clasp segment moderately long, somewhat swollen near the middle and tapering to a roundly toothed apex; dorsal plate moderately long, narrowly divided, the lobes moderately broad and broadly rounded; ventral plate long, deeply and triangularly emarginate, the broad lobes broadly rounded and sparsely setose apically.

Type: Cecid. 1603.

Johnsonomyia braziliensis sp. nov.

This midge is allied to the Guatemalan *J. cincta* Felt, from which it is easily separated by its smaller size, differences in coloration and in the structure of the palpi and ovipositor. The specimen is labeled Igarape-Assu, State of Pará, Brazil, February 4, 1912, and is a part of the Cornell University collections.

Female: Length, 4 mm. Antennæ as long as the body, thickly haired, yellowish transparent; at least 15, and probably 16 segments, the fifth with a stem nearly equal to the thickly haired, cylindric basal enlargement, which latter has a length about twice its diameter and a distinct constriction near the basal third; terminal segment missing. Palpi; first segment with a length about four times its diameter, the second a little longer, slightly thicker, the third a little shorter and more slender than the second, the fourth one-fourth longer than the third, more slender, all thickly haired. Eyes black, holoptic. Mesonotum mostly yellowish transparent, with variable light fuscous markings. Scutellum and postscutellum light fuscous yellowish. Abdomen sparsely clothed with long, whitish hairs, mostly yellowish orange, the dorsum of the third to the seventh segments brownish, the ovipositor pale yellowish. Wings subhyaline with an ill-defined, irregular, fuscous shade resting basally upon the crossvein and extending as a faint, oblique band across the wing, the distal half of the simple fifth vein being distinctly shaded; subcosta unites with the margin near the distal third, the third vein well beyond the apex and the fifth near the basal third; halteres yellowish transparent. Coxæ fuscous yellowish, the legs thickly haired, mostly whitish transparent, except that there is

a brownish shade at the apices of the tibiae; the simple claws stout, strongly curved apically, the pulvilli rudimentary. Ovipositor short, the terminal lobes irregularly quadrangular, obliquely truncate distally and apparently with a flattened, plate-like process at the basal third of presumably the ventral margin; dorsally there are a pair of thickly setose processes tapering to broadly rounded apices.

Type: Cecid. 1593.

Ouradiplosis gen. nov.

The female referred to this genus presumably belongs in the trifli and is easily distinguished from all other Itonidiniæ known to us, by the greatly produced, slender, terminal lobes.

Type: *O. aurata* sp. nov.

Ouradiplosis aurata sp. nov.

The midge described below is labeled Igarape-Assu, State of Pará, Brazil, January 26, 1912. The type is in the collections of Cornell University.

Female: Length, 3.5 mm. Antennæ probably as long as the body, pale yellowish, sparsely haired, with at least 13 and probably 14 segments, the third and fourth free, the fifth with a stem one-third the length of the cylindric basal enlargement, which latter has a length about three times its diameter, a thick subapical band of long, stout setæ and low circumfili at the basal third and apically; terminal segment missing. Eyes holoptic. Palpi; the first segment globose, the second stout, with a length four times its diameter, the third longer than the second, more slender, the fourth three-fourths the length of the third, slender. Mesonotum a nearly uniform yellowish brown, the submedian lines sparsely haired, scutellum and post-scutellum brownish yellow, the abdomen yellowish brown. Wings with the membrane thickly clothed with golden brown hairs, giving a pronounced color, costa light straw, subcosta uniting with the margin just beyond the middle, the crossvein rudimentary, the third vein stout, especially from the crossvein and beyond, and joining the margin well beyond the apex; the fifth vein joining the posterior margin at the distal third, its straight branch shaded with fuscous hairs, uniting with the posterior margin at the basal third; halteres pale yellowish. Coxæ, femora and tibiae pale yellowish orange, the tarsi wanting. Ovipositor short, the terminal lobes sparsely setose, slender and with a length nearly equal to that of the body segment; dorsad of the terminal lobes there is a flattened, hemispherical, sparsely setose, somewhat irregular median elevation.

Type: Cecid. 1594.

This large sized species, although the male is unknown, may be easily recognized by its marked coloration and the peculiar structure of the posterior extremity of the abdomen.

Delphodiplosis gen. nov.

The prolongation of the mouthparts and unidentate claws suggests a relationship with *Stomatosema* Kieff., from which it may be most easily separated by the smaller number of antennal segments. There is also no such curvature of the claws as is attributed to the European genus.

Type: D. cinctipes n. sp.

Delphodiplosis cinctipes sp. nov.

The strikingly colored midge described below was collected December 16, 1912, at Bartica, British Guiana, by Mr. H. S. Parrish and donated to the state collections by Mr. C. P. Alexander.

Female: Length, 3 mm. Antennæ nearly as long as the body, rather thickly white-haired, fuscous yellowish, the stems whitish; 14 segments, the fifth with a stem one-half the length of the cylindric basal enlargement, which latter has a length two and one-half times its diameter; low circumfili at the basal fourth and apically and a thick subapical band of long, whitish setæ; terminal segment with an apical fingerlike process about one-half the length of the produced basal enlargement, which latter has a length fully four times its diameter. Palpi; the first segment rectangular, with a length nearly three times its diameter, the second more slender, with a length twice that of the first, the third a little shorter and more slender than the second, and the fourth a little longer and more slender than the third. Eyes holoptic, the mouthparts produced and about half the length of the diameter of the head. Mesonotum nearly smooth, shining dark brown. Scutellum and post-scutellum fuscous yellowish. Abdomen mostly dark yellowish brown, the pleuræ yellowish. Ovipositor yellowish orange. Wings hyaline, costa especially, and the membrane rather thickly clothed with narrow, dark brown scales, subcosta uniting with the anterior margin near the basal third, the third vein well beyond the apex, the fifth at the distal fourth, its branch near the basal third. Halteres and coxæ yellowish transparent, the anterior and midlegs with the femora, tibiæ and first and second tarsal segments mostly dark brown, the distal portion of the second tarsal segment and the others yellowish brown; posterior legs with the basal two-thirds of the femora and tibiæ white, a narrow band of white on the tibio-tarsal articulation, the second tarsal segment mostly fuscous yellowish, the other tarsal segments like the anterior tarsi; claws stout, evenly curved, unidentate, the pulvilli as long as the claws. Ovipositor short, when extended with a length less than half that of the abdomen, the terminal lobes sparsely setose, very long, slender, with a length fully six times the diameter, minor lobes short, less than one-fourth the length of the principal lobes and thickly clothed with short, stout setæ.

Type: Cecid. 1598.

Epihormomyia gen. nov.

The combination of characters presented by this female are so remarkable that it is assigned to a new genus, a position which we believe will be amply justified when the opposite sex is known.

Epihormomyia auripes sp. nov.

This beautiful species was collected by Mr. H. S. Parrish, March 19, 1913, at Mallali, Demerara River, British Guiana, and donated to the state collections by C. P. Alexander.

Female: Length, 5 mm. Antennæ extending to the sixth abdominal segment, rather sparsely haired, mostly brownish yellow; 14 segments, the third to the ninth distinctly binodose, the tenth and eleventh slightly so, the remainder with a subcylindric basal enlargement, the third and fourth segments fused, the fifth having the stems with a length one and one-half and two and one-half times their diameters, respectively, the basal enlargement subglobose and without circumfili, the distal enlargement cylindric, with a length about three and one-half times its diameter and low circumfili, united by a longitudinal thread, basally and apically; near the middle there is a scattering band of long, slender, curved setæ; the twelfth segment with a stem about one-half the length of the subcylindric basal enlargement, which latter has a length fully four times its diameter, the fourteenth segment with a reduced, fusiform, apical process about one-fourth the length of the subcylindric basal enlargement, which latter has a length four times its diameter and tapers distally. Palpi; first segment subquadrate, the second with a length nearly three times its diameter, the third one-half longer than the second, more slender. Eyes holoptic. Mesonotum not greatly produced as in *Hormomyia*, yellowish orange. Scutellum and postscutellum yellowish. Abdomen mostly dark brown, the long ovipositor dark yellowish brown. Wings hyaline, narrow, with a length about three times the width, subcosta uniting with the margin at the basal third, the third vein well beyond the apex, the fifth at the distal third, its branch near the basal third; halteres pale yellowish. Coxæ dark brown, the legs mostly golden yellow, except the basal third of the anterior and posterior femora, the basal three-fourths of the midfemora and the ventral line on the midtibiæ, these being dark brown; claws on the two tarsi remaining and free from the basal portion of the leg, stout, strongly curved, unidentate, the pulvilli about one-third the length of the claws. Ovipositor stout, about half the length of the abdomen when extended, the terminal lobes sparsely setose, short, broadly and irregularly rounded, minor lobes short, obliquely triangular.

Type: Cecid. 1599.

Lestodiplosis picturata sp. nov.

This midge, collected by H. S. Parrish and donated by C. P. Alexander, is labeled Bartica, British Guiana, December 27, 1912. It is a very strongly marked form and apparently typical of the genus.

Female: Length, 1.2 mm. Antennæ as long as the body, rather thickly haired, mostly pale yellowish, darker basally; 14 segments, the fifth with a stem three-fourths the length of the cylindric basal enlargement, which latter has a length two and one-half times its diameter; terminal segment produced, the basal enlarge-

ment with a length five times its diameter and apically a spindle-shaped, fingerlike process. Palpi; the first segment irregularly ovate, the second with a length five times its diameter, the third as long as the second, the fourth one-fourth longer than the third. Eyes holoptic. Mesonotum reddish brown, the submedian lines yellowish. Scutellum and postscutellum yellowish brown. Abdomen rather thickly haired, mostly dark brown, the incisures dorsally lighter, the venter darker, the ovipositor pale yellowish. Wings strongly marked with dark brown and white patches as follows; on the basal third of the third vein an irregularly, quadrangular, whitish area slightly restricted distally on the third vein and divided by it; at the distal fourth, between the third vein and costa, there are two irregular, transverse, whitish bands, the outer one nearly broken and almost forming a V; caudad of the third vein, near its distal fourth and nearly opposite the irregular, transverse bands mentioned above, are two irregular, angulate, whitish spots close to the third vein; along the fifth vein, near the middle and at its distal fourth, are two ill-defined whitish, angulate areas extending on both sides of the vein; in the anal area there is a lunate, whitish area extending from the fifth vein along its branch to the posterior margin, and basally thereof, a pyriform, whitish area; halteres whitish transparent. Coxæ reddish brown, femora dark straw; tibiæ and tarsi mostly pale straw, the distal tarsal segments darker; claws moderately stout, strongly curved, simple, the pulvilli rudimentary. Ovipositor short, the terminal lobes sparsely setose and narrowly oval.

Type: Cecid. 1597.

EARLY STATES OF STAPHYLINIDÆ.

I. *XANTHOLINUS CEPHALUS* SAY.

BY EDWARD A. CHAPIN,
New Haven, Connecticut.

On July 24, 1914, while collecting larvæ under the bark of decaying *Pinus rigida* Mill., at Springfield, Mass., a number of Staphylinid larvæ, of apparently the same species, were taken. These larvæ were reared and the beetles identified as *Xantholinus cephalus* Say. Since that time I have taken the same species under the bark of *Castanea dentata* (Marsh) Borkh., showing that the species is not confined to *Pinus*. Hamilton (Canadian Ent., 1891, Vol. 23, p. 60) notes the species as occurring under bark at Allegheny, Pa., and also under rubbish on the coast at Atlantic City, N. J.

The rearing was done in plaster-of-Paris nests, modified slightly from those designed and used by Janet ('93) for rearing ants, and similar to those used by Dimmock ('04) in his work on the Carabidæ. Very little difficulty was experienced, the larvæ feeding

readily on small maggots, such as are found under decaying bark. Two larvæ were preserved in alcohol, as were a few pupæ. The rest were allowed to pupate and emerge. All larval and pupal exuviae were preserved. It is from this material that I have made the observations recorded in this paper.

At this time, I wish to extend my sincere thanks to Dr. George Dimmock of Springfield for valuable aid and suggestions, to the staff of the Osborn Zoölogical Laboratory, Yale University, for the use of laboratory instruments and facilities, and to Mr. Herbert S. Barber of the National Museum, for identification of the species.

Larva of *Xantholinus cephalus*

Form depressed slender fusiform, with ventral side of body straight, fitted for locomotion on flat surfaces, eight and one-half times longer than wide, head and thoracic segments nearly equal in width, greatest width at fourth abdominal segment. Length of mature larva, 9.5 mm. *Head* quadrate, depressed, sides nearly parallel. Neck five-eighths width of head, with a V shaped indentation on ventral posterior margin. *Epistoma* pentagonal, reaching posteriorly about one-third distance from anterior margin of clypeus to posterior margin of head, with V shaped indentation in lateral margins, with a large seta slightly posterior to apex of indentation. Other setæ symmetrically arranged. *Frontal angles* not prominent. *Clypeus* not separate from epistoma, dentate on anterior margin, one tooth at middle and four teeth on either side, the first tooth from the middle being the largest. Numerous large setæ symmetrically arranged. *Hypostoma* somewhat pentagonal, about one-half length of head. Four setæ arranged along lateral margins. Horn on each anterior angle, directed forward, one seta at base of each horn. *Ocelli* minute, probably four, confluent. Not apparent in shed larval skins. *Antennæ* four jointed, slightly longer than mandibles; first joint nearly hemispherical, nearly as wide as long, no setæ. Second joint clavate cylindrical, one-fifth as wide as long and four times as long as the first, with a single seta situated near the base on the external dorsal side. Third joint fusiform four times longer than wide and four-fifths as long as the second, outer ventral angle obliquely truncated and bearing on the truncation a prominent acorn shaped appendix, five setæ situated on the upper half of the third joint. Fourth joint slender, somewhat clavate, bearing three large and four small setæ on its tip. Antennal formula: .05 .21 .17 (.03) .10. *Mandibles* three times longer than wide, toothless, slender acuminate falciform, three setæ on outer margin, a small one near the base, a large one the same distance in advance, and a third, small, slightly less than half way between base and apex. *Maxillæ* equal in length to antennæ. Maxillary stipes slightly less than half length of mandible, subcylindrical, five times longer than wide, apex obliquely truncated on inside, with four setæ on outside and two on inside along margins. Outer lobe seven-ninths as long as first joint of palp, a single slender, conical joint four times longer than wide, with a single stout seta at apex. Inner lobe lacking. Palpigerous stipes stout, cylindrical, two-thirds as wide as long, unadorned. Maxillary palp

two-thirds as long as maxillary stipes, first joint twice the length of the palpigerous stipes and nearly equal in width, with two setæ, one on interior margin, one-third of distance from base to apex and the other on the exterior angle of the apex. Second joint two-thirds length of first and two-thirds width, subcylindrical, unadorned. Third joint one-half length and width of second, cylindrical, slightly acuminate, unadorned. Formula of maxilla: Stipes, .31 Palp, .21 Lobe, .07. *Mentum* exerted. Stipites of labial palpi concrete, taken together somewhat depressed clavate, with a shallow indentation on either side of apex, densely clothed with minute setæ. Ligula present, minute, conical. Labial palpi two jointed with terminal appendix. First joint cylindrical, slightly longer than palpigerous stipes, three times longer than wide, unadorned. Second joint cylindrical, slightly fusiform, same length as first, slightly narrower. Terminal appendix tapering cylindrical, two-thirds as long as second joint, unadorned. Formula of labial palp: .06 .06 (.04). *Thorax* composed of three well defined segments. First segment rectangular, nine-tenths as wide as long, tapering posteriorly, slightly chitinous. Numerous setæ arranged as follows: seven large, on or near lateral margins (one at middle, four at anterior angle and two midway between middle and posterior angle). Two on anterior margin, each half way between angle and midline. Two similarly placed near posterior margin. Second segment rectangular, equal in width to first and four-fifths as long. Not chitinous. Numerous setæ as follows: Five large, on or near lateral margins, somewhat as in first. One seta near each anterior angle. Other minute setæ present. Third segment: same size as second. One large seta on margin near anterior angle. Other minute setæ. *Abdomen* composed of nine segments, the last bearing a pair of cerci and anal tube. Segments progress in width to the fourth, then taper to the end. Numerous setæ on each segment. *Anal cerci* two jointed, arising from dorsal, posterior margin of ninth segment. First joint cylindrical, five times as long as broad, with six setæ arranged as in Plate II, Figure 2. Second joint cylindrical, same proportion as first, with two setæ at tip. A minute terminal appendix present. *Legs*. First pair. Femur stout with a few setæ on margins. Tibia cylindrical, same length as femur, armed with a row of seven stout spines on posterior margin. Tarsus cylindrical, armed with stout spines, eight on anterior and seven on posterior margin. Terminates in a single claw. Second and third pairs, similar to first. Comparative lengths of legs:

	1st.	2d.	3d.
Femur.....	25	25	27
Tibia.....	24	26	28
Tarsus.....	21	20	22

Pupa of *Xantholinus cephalus*.

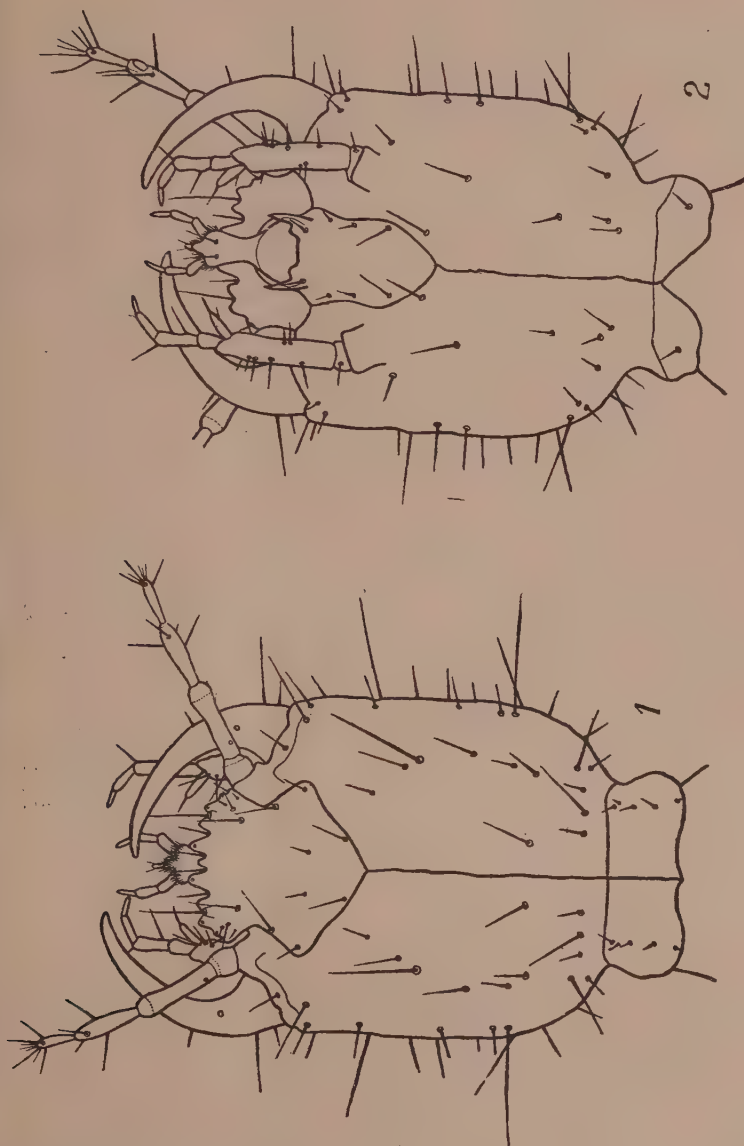
Form coarctate, total length three and one-third times greatest width, greatest width one-third length of pupa from anterior end. Length, 4.8 mm. *Color* chitin colored throughout. *Antennæ* directed posteriorly from insertion and in living pupa, lie concealed under sides of head. *Elytra* and wings small, wrapped closely around body so that they are hardly visible from dorsal surface. *Stigmata* of thorax concealed, those of abdomen visible from dorsal side, peritremes protruded, slightly

darker than rest of body. *Setæ* absent. *Dorsal view*: Head and anterior margin of prothorax hidden. Knees of first pair of legs visible at sides of prothorax, near posterior margin. Knees of third pair of legs project at sides of second abdominal segment. *Prothorax* rounded triangular, joined to mesothorax by a straight line. *Mesothorax* convex, suture separating it from elytra not definable. Anterior margin straight, posterior margin with a median protrusion extending one-third into the metathorax. *Metathorax* slightly convex, same width as mesothorax, anterior margin following line of joint with mesothorax, posterior margin straight. Formula expressing ratio of lengths of thoracic segments: 37 18 23. *Abdomen*: First segment slightly longer and wider than metathorax, second segment but half the length of first and of equal width. Segments increase in width to the fifth from whence they taper to the end. Stigmata near the lateral margins. *Cerci* inconspicuous. *Ventral view*: Head semicircular in front surrounded in anterior outline by prothorax and, from vertex to tip of mandibles, slightly more than one-third total length of pupa. Eyes not conspicuous until coloration previous to emergence sets in, when they are seen to be just above base of mandibles. Tip of antenna reaches slightly beyond eye. Mandibles slightly more than one-fourth of length of head, closed but do not overlap. Labrum extends down as far as tip and covers interior halves of mandibles. Labrum notched at tip. Maxillary palps extend slightly below mandibles, the part in view roughly triangular. Labial palps hidden. *Legs*: First pair. Femora hidden beneath head with exception of tips, which are visible at the sides of the head where the antennæ are inserted. Tibiæ directed posteriorly from this point and reach to the eyes. Tarsi are nearly parallel and reach posteriorly nearly to the tips of the mandibles. Second pair. Femora of second pair of legs completely hidden by head. Tibiæ partially hidden by tarsi of first pair, but do appear outside first legs near the eyes. Tarsi parallel and extend below the mandibles a distance equal to that across the tips of the maxillary palps. Third pair. Femora are visible and extend in nearly a straight line at right angles to the body. Tibiæ extend inward and posteriorly and end at the posterior margin of the third abdominal segment. Tarsi are parallel and extend almost to the middle of the fifth segment.

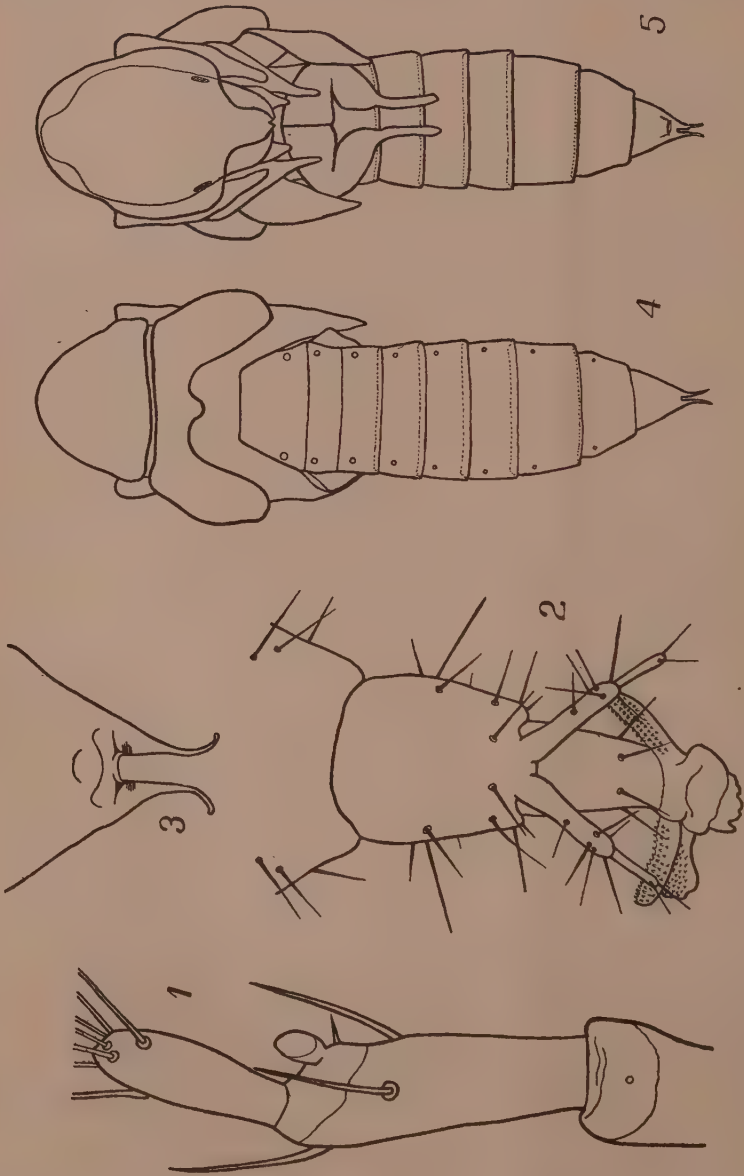
Osborn Zoological Laboratory,
Sheffield Scientific School,
New Haven, Connecticut.

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CHAPIN—*Xantholinus cephalus*.



CHAPIN—*Xantholinus cephalus*.

DESCRIPTION OF PLATES.

XIII

Fig. 1. Head of larva, dorsal view. X 55.

Fig. 2. Head of larva, ventral view. X 55.

XIV

Fig. 1. Detail of antenna, larva, showing appendix. X 235.

Fig. 2. Anal cerci of larva, dorsal view. X 55.

Fig. 3. Anal cerci of pupa, ventral view. X 55.

Fig. 4. Pupa, dorsal view. X 20.

Fig. 5. Pupa, ventral view. X 20.

SOME MYRMECOPHILOUS INSECTS FROM HAYTI.¹

BY WILLIAM M. MANN,

Bussey Institution, Harvard University.

The insects here noted were collected in Hayti during the winter of 1912-13. Few myrmecophilous insects have been recorded from the West Indies, though no doubt many occur there as the ant fauna is varied and abundant and contains many ancient types. Of these *Aphænogaster relictæ* Wheeler & Mann is the predominant Myrmicine ant on the island, and this species was found to harbor several interesting inquilines.

In addition to the species recorded in these notes several others of possibly myrmecophilous habits were taken. I hope to list these after further study.

Mr. A. B. Wolcott, of the Field Museum at Chicago, has very kindly drawn the accompanying figures.

The types of the new species have been deposited in the Museum of Comparative Zoölogy at Cambridge.

ORTHOPTERA.

FAMILY GRYLLIDÆ.

Myrmecophila prenolepidis Wasmann.

A single specimen was taken from a colony of *Prenolepis longicornis* Latr. at Manneville near the shores of Lake Assuei. Another

¹ Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 101.

was seen in this locality in a nest of the same species of ant, but escaped. This cricket was described by Wasmann from examples sent to him from India by P. J. Assmuth, and from Pará, Brazil, by E. A. Göldi. In both localities the host ant was *Prenolepis longicornis*. Wasmann's Brazilian specimens were lighter in color than those from India and the light transverse abdominal band was indistinct. The Haytian example is more like the Indian form, being dark brown in color with a distinct light yellowish band transversely across the first segment of the abdomen.

This cricket and the beetle, *Coluocera maderæ* Woll., are the characteristic guests of *Prenolepis longicornis*. The host ant is one of the most widely distributed of all the Formicidæ. It has been recorded from practically all tropical and subtropical regions, and occurs occasionally even in the temperate parts of the world, where it has been introduced through commerce. Nests are of common occurrence on shipboard. It is evident from the varied localities from which the twoinquilines have been recorded, that they are capable of adapting themselves to the different environments in which the host nests, and that they are extending their range, following the ant in its wanderings.

HEMIPTERA.

FAMILY CERCOPIDÆ.

Two nymphs of an undetermined Cercopid were found with large colonies of *Aphanogaster relictæ* subsp. *epinotalis* Wheeler & Mann at Manneville. The body of this Hemipteron is very much flattened dorsoventrally, so that it has the appearance of a small cockroach, which it resembles also in its manner of running.

FAMILY MEMBRACIDÆ.

A single immature individual of an undetermined Membracid was found living in a nest of *Macromischa sallei* subsp. *haytiana* Wheeler & Mann at Furcy. Euslin has recently observed (Zeits. f. wiss. Insektenbiol. Vol. VII, pp. 19-21) that the European ant *Formica cinerea* F. often carries into its nests nymphs and adults of *Gargara genistæ* F., a common European Homopteron. Those which he observed soon died, probably because of lack of food in the subterranean nests of the ants. The nest of *Macromischa*,

which is built of carton about the branches of living shrubs, offers available food supply to any Homopteron that might enter or be carried into it. Still the habit can not be very general, for numerous nests were examined and no more individuals were found.

Fustiger haytiana sp. nov. (Figs. 1 and 2.)

Length, 2.25 mm. Color yellowish brown, the head, antennæ and prothorax considerably darker than the abdomen. Head a little more than twice as long as

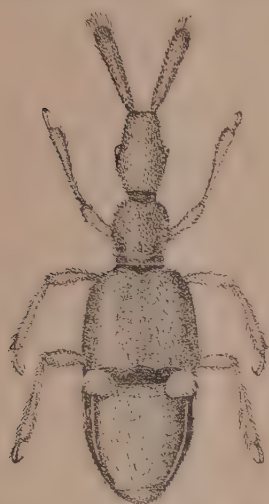


Fig. 1. *Fustiger haytiana* sp. nov.

broad, broadest behind the eyes, from which the sides are nearly straight and slightly converging to occiput; occipital corners angulate, the border deeply concave; sides in front of eyes slightly convex, nearly as widely separated at base of clypeus as at eyes, eyes convex, about one sixth as long as head; antennæ slightly longer than head, third joint clavate, constricted at basal third, about seven times the length of the second, broadly rounded at apex; head and antennæ subopaque, coarsely rugulose-punctate, beset with short yellowish hairs, which are erect on head and at apex of antennæ, and semi-recumbent on remainder of antennæ. Prothorax as long as head, broadest in front of middle, narrowed anteriorly; sides posterior to the broadest part slightly concave; posterior corners angulate, the border slightly concave; disc with a large shallow, median fossa a little posterior to the middle. Elytra shining, finely, sparsely punctate, with scattered, short, erect hairs; together three fourths as long as broad; anterior border concave; sides rounded, gradually diverging to the posterior

border; posterior corners rounded. Inner border of each elytron strongly, though narrowly margined, with an entire stria approximate and parallel to the margin. Abdomen shining, finely punctate and with erect hairs; at base a little narrower than the elytra; first segment basally very deeply impressed transversely and having on either side of this depression a large rounded tubercle which bears a thin bunch of short, recumbent hairs; sides rounded, margined, with strong striæ that extend from the middle of tubercles to the apical corners of first segment. Propygidium about three times as broad as long. Legs rather slender; tibiæ apically as thick as the femora; with suberect hairs. Middle femora with a long, curved, blunt process near the base. Ventral surface shining, minutely punctate.

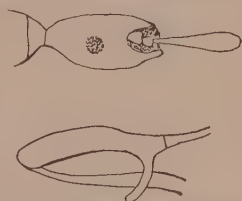


Fig. 2. *Fustiger haytiana* sp. nov. above, head from side; below, middle femur.

Described from a single specimen taken at Diquini in a nest of *Aphænogaster relictæ*. The only other West Indian Fustiger is *F. smithi* Raf. from St. Vincent. *F. haytiana* differs in being larger (*smithi* is only 1.65 mm. in length) and in not having the elytra rugosely punctate at base.

FAMILY LATHRIDIIDÆ.

Coluocera maderæ Woll.

Taken in numbers at Manneville, in company with *Prenolepis longicornis*.

This beetle was first described from Madeira, where it was found in the nest of an ant. The name of the host was not given, but Wasmann reasonably supposes that it was *Prenolepis longicornis*. This author has given an interesting account of the beetle (Zeitschr. f. wiss. Insektenbiol. 1905, pp. 384-390), in which he records it from India, Pará, Brazil, and the island of Trinidad as well as from Madeira. In each locality it occurs with *Prenolepis longicornis*, but in India it has been found also with *P. indica* Forel and also with species of the genus *Pheidole*, however, usually with the first named ant. Assmuth notes (Zeitschr. f. wiss. Insektenbiol. 1907, p. 330) that at Bombay, India, it is very abundant, while rare at Khandalo. In Hayti about Lake Assuei it was abundant, but sporadic. Dozens of specimens occurred in some nests while in the immediate vicinity others would not contain a single individual, and although the host ant is common throughout the island at the lower altitudes, I did not find the beetles in any other locality.

HYMENOPTERA.

FAMILY BETHYLIDÆ.

Pseudisobrachium terresi sp. nov.

Female (Fig. 3): Length, 6 mm. Color black, except the mandibles, antennæ and legs exclusive of the outer side of the front coxæ, which are rufous, and the apical margins of abdominal segments, which are indistinctly rufous. Head one and one fourth times as long as broad, broadest behind base of mandibles; sides subparallel, very slightly convex; occipital margin straight; at corners broadly rounding into the sides; above closely foveolately punctured, except for a narrow, longitudinal, median space extending the entire length, which is smooth. Clypeus very strongly

carinate. Mandibles thick, tridentate. Antennæ short, extending about half their length past the occipital margin, 13-jointed; the scape punctate, as long as the first five joints of the flagellum together; pedicel globular; first and second joints of flagellum equal, slightly longer than broad; joints 3 to 10 transverse, subequal; apical joint nearly twice the length of penultimate. Ocelli absent; eyes minute, situated on sides of head at about one sixth the distance from clypeus to occiput. Prothorax one and three fourths times as long as broad, sides nearly parallel, rounded anteriorly, coarsely but sparsely punctate except for a smooth longitudinal median surface; the collar densely, minutely striolate transversely. Mesothorax subcordate, without a scutellum, separated from prothorax by a deep impression; with distinct parapsidal furrows; mesonotal furrows strongly impressed, diverging outwardly at anterior border, extending entire length; surface above smooth at middle and in a narrow space outward from the furrows and parallel to them, elsewhere with scattered coarse punctures. Metanotum twice as long as broad, broadest behind middle, smooth at middle, coarsely punctate at sides, posterior portion delicately striolate transversely. Abdomen cylindrical, about three times as long as broad, with fine scattered punctures. Legs stout, finely punctate, middle tibiæ and tarsi spinose.

Body shining, with scattered yellow hairs, which are most abundant on abdomen, legs, head and antennæ.

Described from a single specimen taken in a nest of *Aphænogaster relicta* at Diquini. The species is named after Dr. John B. Terres, United States Consul General to Hayti, in recognition of his interest in the fauna of the island. The only other species of *Pseudisobrachium* known to occur in the West Indies are *P. collinum* and *P. albipes* which were described by Ashmead from males taken in St. Vincent. Besides *terresi* the habits of only five species of this genus have been recorded and these all live



Fig. 3. *Pseudisobrachium terresi*
sp. nov.

in ant nests, where it is to be supposed they are parasitic on the immature stages of the hosts.

DIPTERA.

FAMILY SYRPHIDÆ.

Several pupæ of a Microdon-like insect were found at Diquini beneath bark with colonies of *Pheidole flavens* Roger var. *haytiana*. These pupæ are small (4 mm. in length) and reticulately tuberculate. Between these tubercles the surface is smooth. The tegument is very thin. I was not able to rear any adults.

NOTES AND DESCRIPTIONS OF PIPUNCULIDÆ.

BY NATHAN BANKS,
East Falls Church, Virginia.

During the past few years I have taken a number of Pipunculidæ, and in going over the material with that named by Cresson I am able to identify most of them and find four species that are plainly new; a few other specimens may also be new. Several of the species I have taken in Virginia for the first time, making 27 species of *Pipunculus* from Virginia.

Pipunculus loewi Kertz.

A male from Glencarlyn, Va., 23 June, runs here in the table and agrees with the description. It has a banded abdomen as in my new species *cinctus*, but the hypopygium is larger, not cleft, and the stigma is shorter.

Pipunculus houghi Kertz. (*femoratus* Cr.).

A female from Falls Church, Va., 9 July, agrees with description and the male cotypes.

Pipunculus æquans Cr.

Various specimens from Chain Bridge, Falls Church, and Glencarlyn, Va., in June and July agree with a cotype.

Pipunculus varius Cr.

From Chesapeake Beach, Md., and Falls Church, Va., in September and October, agree with type from Pennsylvania.

Pipunculus sororius Cr.

This is common here in June, July and August. I think this should be *nitidiventris* Lw.

Pipunculus subvirescens Lw.

From Falls Church, Va., in June and August agree with description; the hind trochanter is rather angularly produced but there is no spine.

Pipunculus constrictus Bks.

Cresson has recorded a specimen that did not have a constricted abdomen, and I have taken a male, Falls Church, Va., 14 May, which also has the abdomen normal; the appendiculate vein (as in type) is very short, and in one wing practically obsolete, but the vein angularly bent at that place.

Pipunculus brevis Cr.

Specimens from Great Falls, 5 June, 13 August. All show the appendiculate vein as figured. The males (agreeing in venation with the females) have the abdomen rather narrow, the segments narrowly velvety black on base; on fifth segment interrupted in middle; the apical part of fifth rather silvery, and depressed in the middle; the hypopygium not bent under, hardly one-half as long and not nearly as wide as fifth segment, with an oblique cleft to the right, and of a dark brown color. In Cresson's table the male runs to *appendiculatus*, from which it is separated by normal occiput, velvety bands on abdomen, paler legs, etc.

Pipunculus fuscus Lw.

Various specimens from Falls Church, and Glencarlyn, Va., in June, July, August and September, are larger than *cingulatus*, the abdomen being longer and more slender; the tibiæ generally paler. The fourth section of the fourth vein is much more sinuate than in my specimens labelled *cingulatus*, but Cresson has figured it the opposite way.

Pipunculus caudatus Cr.

From Falls Church and Glencarlyn, Va., in May, June and September, specimens which agree with the type and have the quadrate hypopygium.

Pipunculus tarsalis Bks.

Males from Falls Church, Va., in August and September agree with the type from Ithaca, N. Y.

Pipunculus pallipes John (*houghi* Cr.).

Two from Falls Church, Va., 9 July.

Pipunculus subopacus Lw.

From Great Falls and Falls Church, Va., June.

Pipunculus confraternus Bks.

From Falls Church, Va., June, August, September.

Pipunculus discolor Bks.

One from Falls Church, Va., 7 September.

Pipunculus atlanticus Hough.

From Falls Church, Chain Bridge, Great Falls, Va., May and June. A variety with the abdomen wholly sericeous; also in June.

Pipunculus minor Cr.

From Great Falls and Falls Church, Va., May and June.

Pipunculus unguiculatus Cr.

From Falls Church, May and September.

Pipunculus latipennis sp. nov.

♀. Face and front silvery; third joint of the antennæ pale yellowish, long acuminate. Humeri pale; abdomen shining, but rather duller near base, and basal segment and below scutellum silvery; abdomen not twice as long as broad, bent down at tip, ovipositor short, hardly reaching one-third way to base, it and its base yellowish; legs pale, femora, especially the hind pair, discolored in middle; halteres pale, tip of knob brown, wings hyaline, veins dark, stigma distinct; the wing extremely broad near tip and broadly rounded; the fourth section of the costa twice as long as the stigma; the fourth section of fourth vein not nearly as long as the third section.

Length: 2.6 mm.

From Falls Church, Va., 4 July. The very broad wing will separate from all our known forms. It will run to *P. luteicornis* in the Cresson table.

Pipunculus terminalis sp. nov.

♂. Runs to *P. discolor* in the Cresson table; but only one-half as large, and antennæ and venation different. Face black; antennæ brown, last joint short,

rounded; thorax dark brown, humeri dark; abdomen velvety black, except last segment and the hypopygium which are smooth and nearly shining, and the base below scutellum which is silvery. Legs mostly blackish, knees pale; halteres brown. Wings long and narrow, slightly fumose, stigma distinct, longer than next section, fourth section of fourth vein much longer than third, and this fourth section does not bend up at once, but runs out for some distance before turning up; the posterior cross-vein fully its length from margin. The hypopygium broad, almost rectangular, with large apical cleft.

Length: 2 mm.

From Falls Church, Va., 28 June, 9 August, and Great Falls, Va., 21 September. This species is close to *varius*, but different in antennæ, black face, not shining abdomen, etc.

Pipunculus cinctus sp. nov.

♂. Face silvery; antennæ dark, last joint short acuminate, point whitish; humeri dark, but upper edge rather pale; halteres dark; legs mostly dark, knees and basal joints of tarsi pale; abdomen with a silvery band across apex of first four segments, basal part of three of them rather velvety black; hypopygium with apical cleft, much shorter than the preceding segment, not bent under. Wings rather infuscated, stigma dark, twice as long as next section of costa, third section of fourth vein not twice as long as second section; fourth section about as long as third, nearly straight from posterior cross-vein to margin, posterior cross-vein oblique.

Length: 2.5 mm.

From Falls Church, Va., 1 June, 7 September. From *semi-asciatus* (cotype) differs in smaller size, the straight fourth section of fourth vein, longer third section, etc.; *nigricornis* is said to have the bands interrupted, moreover it is larger.

Verrallia virginica sp. nov.

♂. Face and front silvery, eyes not quite touching; vertex black, with ocellar bristles; antennæ dark, last joint short, and rounded; thorax black; abdomen black, segments with a narrow silvery apical margin; last segment more gray; legs mostly black, knees and basal part of tarsi pale; halteres pale; wings hyaline, stigma distinct, fourth section of costa not quite as long as stigmal section, anterior cross vein plainly before middle of discal cell, fourth section of fourth vein appendiculate, the posterior cross vein more than its length from border. Abdomen slender, subcylindric, hypopygium asymmetrical; body and legs hairy, the scutellum with longer bristles.

Length: 4 mm.

From Glencarlyn, Va., 9 June. Williston in his "Manual" figures the wing of this species.

EXPLANATION OF PLATE XV.

- Fig. 1. *Pipunculus terminalis*, part of wing.
 Fig. 2. *Pipunculus latipennis*, wing.
 Fig. 3. *Pipunculus latipennis*, antenna.
 Fig. 4. *Pipunculus latipennis*, ovipositor.
 Fig. 5. *Verrallia virginica*, antenna.
 Fig. 6. *Pipunculus cinctus*, wing.
 Fig. 7. *Verrallia virginica*, tip of abdomen, above.
 Fig. 8. *Pipunculus terminalis*, antenna, tip of abdomen, above.
 Fig. 9. *Verrallia virginica*, wing.
 Fig. 10. *Pipunculus cinctus*, antenna.

SYSTEMATIC PAPERS ON NEW ENGLAND
HEMIPTERA.¹II. SYNOPSIS OF THE PENTATOMIDÆ.²

BY H. M. PARSHLEY.

With Plate XVI.

Family PENTATOMIDÆ.

1. First segment of the rostrum largely free, relatively short and thick; bucculæ small, more or less distinctly united under the rostrum posteriorly, hence converging; insertion of rostrum close to end of tylus (fig. 4)

4. ASOPINÆ.

First segment of rostrum largely embedded between the bucculæ, relatively slender; bucculæ large, not united posteriorly, hence more or less parallel; insertion of rostrum separated from end of tylus by a space about equal to width of basal segment (fig. 1) *Pentatomina* Kirk 2

¹ Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 98.

² I have found the following works, among others, to be of especial assistance in the study of this family:

Stål: Enum. Hem. I., K. Sv. Vet.-Ak. Handl. IX., 1870. Oef. K. Vet.-Ak. Förh., XXIV., No. 7, 1867, p. 522.

Van Duzee: List. Pent. N. Am., Tr. Am. Ent. Soc. XXX., 1904, p. 1. Can. Ent., XLI., 1909, p. 369, and other papers.

Kirkaldy: Cat. Hem. I., 1909, and other papers.

Heymons: Beitr. Morph. u. Entw. Rhynch. Nova Acta Ac. Leop. Carol. LXXIV., 1899.

Summers: Pr. Iowa Ac. Sci., VI., 1908, p. 40.

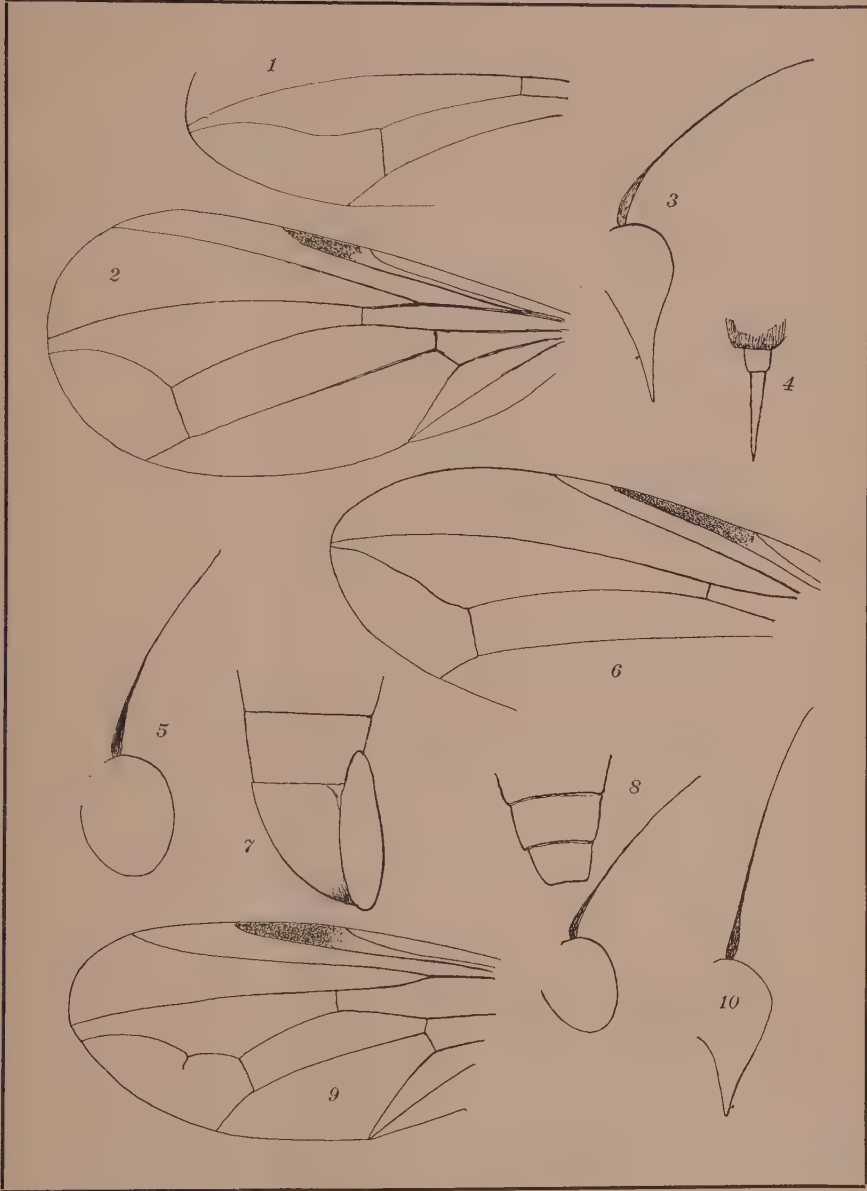
Bergroth: Ann. Soc. Ent. Belg., LVIII., 1914, p. 24. Ent. News, XVIII., 1907, p. 48, and other papers.

Breddin: Beitr. Sys. Pent. Süd-am., Sitz. Ges. Nat. Fr., 10, 1907, p. 328.

Schouteden: Gen. Ins., Het., 1905-1907.

Torre Bueno: Ent. News, XXIII, 1912, p. 316.

Correction: PSYCHE, June, 1915, p. 93, in the description of the Pentatomidæ the tarsi should be given as 2- or 3-segmented.



BANKS—*Pipunculidae*.

2. Tarsi 2-segmented; sternum with a distinct longitudinal keel; frena¹ extending almost to end of scutellum.....3. ACANTHOSOMATINÆ
Tarsi 3-segmented; sternum without keel; frena shorter.....3
3. Scutellum large, broad at apex, extending farther posteriorly than the corium; frena very short; sides of the pronotum with a single prominent tooth just anterior to lateral angle, the angles thus emarginate
1. GRAPHOSOMATINÆ
Scutellum smaller, more or less narrowed apically, generally shorter than the corium; frena longer; pronotum with numerous teeth or with no tooth near lateral angle.....2. PENTATOMINÆ²

1. Subfamily GRAPHOSOMATINÆ.

Tribe PODOPINI.

Genus Podops Laporte.

Size larger, length about 6.5 mm.; 2d, 3d, and 4th segments of antennæ darker; lateral tooth of pronotum obtuse; color very dark brown....*cinctipes* Say.
Size smaller, length 5 mm.; 2d, 3d, and 4th segments of antennæ paler; lateral tooth of pronotum acute; color as in the preceding.....*parvula* V. D.

2. Subfamily PENTATOMINÆ.

1. Body very flat, margins explanate; head with thin dilated margin, about as wide as base of scutellum, flat above; scutellum broad, scarcely narrowed apically (fig. 5) 1. SCIOCORINI
Body not extremely flat and explanate; head not very widely dilated, when nearly as wide as base of scutellum head is distinctly convex above, usually narrower than scutellum.....2
2. Jugal with a prominent lateral tooth near apex (fig. 3); abdomen shallowly sulcate beneath; rostrum extending behind posterior coxæ.....2. HALYINI
Jugal without lateral tooth (fig. 6); abdomen not sulcate; rostrum shorter
3. PENTATOMINI

1. Tribe SCIOCORINI.

Genus Sciocoris Fallén.

Color brown, connexivum³ spotted; length 6.5 mm (fig. 5).⁴ *microphthalmus* Flor.

¹ The frena are longitudinal grooves in the edges of the scutellum which receive the inner margins of the hemelytra. They end about where the clavus disappears beneath the scutellum.

² In the latest general catalogue (Kirkaldy, 1909) the Acanthosomatinae and Graphosomatinae are given as tribes of the Pentatominae. This matter is still open to discussion, I believe, but in the present series I plan to follow the check-list of Van Duzee, to whom I am again indebted for advance information.

³ The marginal region of the abdomen. There are very few records of the occurrence of *Sciocoris* in this country, and collectors should be on the watch for it.

⁴ The ocelli in this species are very small and unfortunately do not show in the figure.

2. Tribe HALYINI.

Genus *Brochymena* Amyot et Serville.

1. Lateral angles of thorax distinctly produced in a short truncated dentate lobe, not rounded anteriorly; scutellum with a distinct transverse elevation at base; connexivum very wide; color indistinctly mottled grayish brown; length 14-16 mm. *arborea* Say.
Lateral processes less abrupt, rounded anteriorly, finely denticulate; scutellum less strongly elevated at base. 2
2. Juga extending much beyond apex of tylus, contiguous anteriorly, or separated, thus forming a long narrow apical sinus; connexivum moderately wide; color as in the preceding; length 15-17 mm. *quadripustulata* Fab.
Juga extending but little beyond apex of tylus, tips more or less convergent above, forming a short, sometimes transverse sinus; connexivum narrow; markings more contrasted; length 13-17 mm.
..... *carolinensis* Westw. or *annulata* Fab.

3. Tribe PENTATOMINI.

1. Head very convex above, triangular, almost as broad as scutellum; juga distinctly longer than tylus; apex of corium broadly rounded. 2
Head more nearly flat above, narrower; juga often not longer than tylus; apex of corium generally with a distinct, but sometimes rounded angle; if juga are longer than tylus, or apex of corium is broadly rounded, head is not more than two-thirds width of scutellum. 3
2. Anterior angles of pronotum projecting distinctly forward; pronotum with three longitudinal pale stripes 10. *Aelia*
Anterior angles not so projecting; pronotum with one stripe. 11. *Neottiglossa*
3. Base of abdomen armed below with a median spine or tubercle, directed anteriorly 17
Base of abdomen unarmed. 4
4. Lateral margins of juga widely reflexed and greatly thickened; orifices placed a little farther outward than lateral margin of intermediate coxal cavities, not elevated; front of head almost vertical. 15. *Murgantia*
Lateral margins of juga not or only narrowly reflexed, not greatly thickened; orifices and head usually otherwise constructed. 5
5. Scutellum broad and rounded at apex, lateral margins almost straight; head strongly bent downwards. 12. *Cosmopepla*
Scutellum generally narrowed at apex, lateral margins concave (as in fig. 2); head not or slightly bent downwards. 6
6. Orifices without sulcus, or with sulcus which ends abruptly. 7
Orifices with a gradually disappearing prolongation. 14
7. Veins of membrane irregularly anastomosing or with numerous branches more or less distinct. 8
Veins simple or slightly branched. 10
8. Scutellum broadly rounded at apex, as long as corium; apical margin of corium rounded, apical lateral angle obtuse. 8. *Cœnus*
Scutellum narrowed at apex, shorter than corium; apical margin straight, apical lateral angle acute. 9

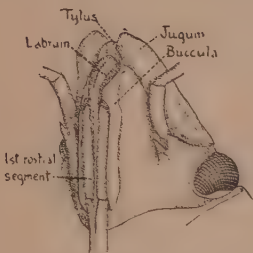


Fig. 1. Ventral view of head of *Rhytidolomia senilis*.



Fig. 4. Ventral view of head of *Apateticus bracteatus*.



Fig. 2. Scutella of *Thyanta*.
After Barber

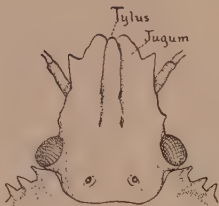


Fig. 3. Head of *Brochymena arborea*.

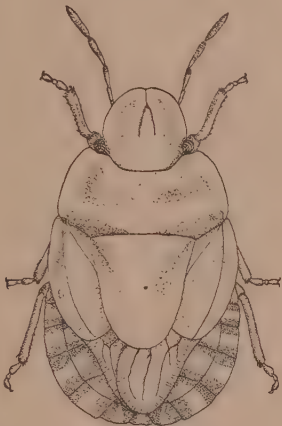


Fig. 5. *Sciocoris microphthalmus*.



Fig. 6. Head of *Rhytidolomia senilis*.

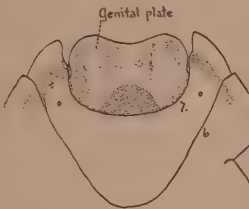


Fig. 7. External genitalia of *Euschistus variolarius* ♂.

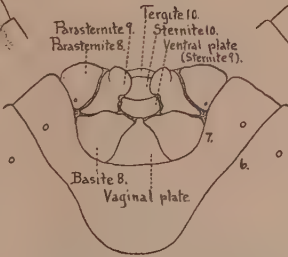


Fig. 8. External genitalia of *Apateticus bracteatus* ♀.



Fig. 9. External genitalia of *Apateticus cynicus* ♀.

1915

9. Frena extending just to middle of scutellum; bucculae increasing in height posteriorly, ending abruptly; lateral margin of pronotum not explanate; rostrum extending a little beyond intermediate coxae. 9. *Hymenarcys*
Frena extending beyond middle of scutellum; bucculae decreasing in height posteriorly, elevated anteriorly into an angle; lateral margin of pronotum explanate in front; rostrum extending beyond intermediate coxae 13. *Menecles*.
10. Frena extending beyond middle of scutellum. 11
Frena shorter 2. *Trichopepla*
11. Tibiae distinctly and broadly sulcate throughout their length. 12
Tibiae not so sulcate. 14
12. Lateral margins of pronotum crenulate, lateral angles prominent, rounded or acuminate; head rather elongate. 7. *Euschistus*
Lateral margins of pronotum not crenulate, lateral angles not prominent; head shorter. 13
13. Form elongate; color olivaceous green; second and third segments of rostrum nearly equal, fourth shorter. 4. *Rhytidolomia*
Form broad; color clear green; second segment of rostrum longer than third, third nearly equal to fourth. 3. *Chlorochroa*
14. Thorax armed on each side with a long anteriorly projecting spine; first segment of rostrum shorter than bucculae; form elongated; margin of scutellum concolorous. 6. *Solubea*.
Thorax unarmed; first segment of rostrum longer than bucculae; form broad; scutellum outlined with white. 5. *Mormidea*
15. Juga not longer than tylus. 14. *Thyanta*
Juga longer than tylus, almost or quite contiguous in front (somewhat as in fig. 5) 16
16. Prothorax with conspicuous white impunctate margins extending around lateral angles. 1. *Peribalus*
Prothorax without such margins, impunctate anteriorly only 19. *Dendrocoris*
17. Fifth antennal segment more than twice the length of second; apex of scutellum and anterior region of prothorax lighter; species olivaceous green in color 18. *Banasa*
Fifth antennal segment less than twice length of second; scutellum and prothorax concolorous; species clear green in color. 18
18. Orifices short, rather broad, not extending more than half way to lateral margins of metapleura, ending abruptly. 17. *Nezara*
Orifices continued in a long narrowing ruga, extending almost to posterior lateral angles of mesopleura. 16. *Acrosternum*

1. Genus *Peribalus* Mulsant et Rey.

Holcostethus Kirk. in part.

Color brown, tip of scutellum and margins of body more or less pale; length 7.5–9 mm. *limbolarius* Stal.

2. Genus *Trichopepla* Stal.

Color brown with faint paler markings; connexivum spotted; body pilose; length 6.5–8 mm. *semivittata* Say.

3. Genus *Chlorochroa* Stal.*Pentatoma* Auct. in part.*Rhytidolomia* Kirk, in part.

Color green, margins of body and tip of scutellum reddish yellow; length 12–14 mm.
uhleri Stal or *persimilis* Horv.¹

4. Genus *Rhytidolomia* Stal*Pentatoma* Auct. in part.

Larger, length 16 mm.; lateral margins of pronotum narrowly reflexed (fig. 6) color dark olive brown, the margins paler.....*senilis* Say.
 Smaller, length 9.5–11 mm., pronotal margins not reflexed; color dark olive, with median and lateral pale stripes.....*saucia* Say.

5. Genus *Mormidea* Amyot et Serville.

Color dark brown, pronotum with two transverse pale stripes, lateral margins of scutellum and edges of connexivum pale; length 6 mm.....*lugens* Fab.

6. Genus *Solubea* Bergroth.*Oebalus* Stal.

Color light brown, scutellum and markings of head paler; length 8–10 mm.

pugnax Fab.7. Genus *Euschistus* Dallas.

1. Pronotum with a distinct more or less impunctate raised line running transversely between the lateral angles; pronotum distinctly wider than the abdomen; juga generally somewhat longer than the tylus; color variable, generally some shade of brown throughout the genus; length about 11 mm.

ictericus Linn.

Pronotum without such a line, proportionately narrower.....2

2. Juga distinctly longer than the tylus, apex of head thus emarginate; hemielytra covering the connexivum; length 12–15 mm.

fissilis Uhl. or *euschistoides* Voll.

Juga not or very slightly longer than the tylus, apex of head thus rounded or truncate.....3

3. Lateral angles of the ventral abdominal segments concolorous; genital plate of the male with a dark spot (fig. 7); form somewhat narrowed posteriorly; length about 13 mm.....*variolarius* Pal. Beauv.

Lateral angles of the ventral segments with a black dot; hemielytra generally not covering the connexivum.....4

4. Smaller, length 8–9 mm., form rather flattened; lateral margins of pronotum pale and somewhat swollen, the closely set marginal punctures forming a distinct black band.....*politus* Uhl.

Larger, length 10 mm. or more; form more convex.....5

5. Larger, length 12–15 mm; abdomen without a median ventral row of black spots
servus Say.

Smaller, length 10–12 mm.; abdomen usually with a median ventral row of black spots more or less developed.....*tristigmus* Say.

¹ These forms are considered identical by Van Duzee.

8. Genus *Cœnus* Dallas.

Color brown, finely dotted with black; length about 8 mm. *delius* Say.

9. Genus *Hymenarcys* Amyot et Serville.

Lateral margins of pronotum arcuate; larger, length 9 mm.; color dark brown
nervosa Say.

Lateral margins of pronotum straight; smaller, length 7.5 mm.; color about as in
 preceding *æqualis* Say.¹

10. Genus *Aelia* Fabricus.

Color light brown with longitudinal pale stripes; length 8 mm. *americana* Dallas

11. Genus *Neottiglossa* Kirby.

Color brown with rather faint pale markings; length about 5 mm. *undata* Say.

12. Genus *Cosmopepla* Stal.

Color black with red markings; length about 5 mm.
linteriana Kirk. or *carnifex* Fab.

13. Genus *Menecles* Stal.

Color brown, connexivum spotted; length 13 mm. *insertus* Say.

14. Genus *Thyanta* Stal.

Scutellum less elongated apically, shorter as a whole (fig. 2); form of body shorter
 and broader; colors constant, dark green, prothorax narrowly black laterally,
 and with a distinct purplish transverse band between the lateral angles; length
 about 9 mm. *calceata* Say.²

Scutellum more elongated apically, longer as a whole (fig. 2); general form more
 elongated; colors variable, very light to dark green, transverse band of pronotum
 more or less distinct; length about 11 mm. *custator* Fab.²

15. Genus *Murgantia* Stal.

Color black, variegated with red; length 10 mm. *histrionica* Hahn.

16. Genus *Acrosternum* Fieber.

Nezara Kirk. in part.

Form broadly oval; sides of pronotum arcuate anteriorly; rostrum scarcely
 reaching intermediate coxæ; color shining clear green; length about 17 mm.

pen(n)sylvanicum (de G.) Pal. Beauv.

Form more elongate; sides of pronotum straight anteriorly; rostrum reaching inter-
 mediate coxæ; color and size about as in preceding. *hilare* Say.

17. Genus *Nezara* Amyot et Serville.

Color dull green; length about 16 mm. *viridula* Linn.

¹ Asterisk marks species not known to occur in New England. Dagger marks species which I have not seen.

² For further details regarding these species and figures of the male genitalia, see Barber: Jour. N. Y. Ent. Soc., XIX., 1911, p. 9.

18. Genus *Banasa* Stal.

1. Posterior lateral angles of abdominal segments acuminate, projecting somewhat; color brownish; 10 mm. *sordida* Uhl.
Posterior lateral angles obtuse, not very prominent. 2
2. Third antennal segment about twice as long as second; head broad anteriorly; margin of abdomen with conspicuous black dots at the angles of the segments; color greenish with olivaceous markings; length 7.5–11 mm. . . . *dimi(di)ata* Say.
Third antennal segment but little longer than the second; head narrowed anteriorly; margin of abdomen with conspicuous black dots; ventral abdominal punctures fewer and paler; genital plate of male narrower; colors somewhat paler; length 9–11 mm. *calva* Say.

19. Genus *Dendrocoris* Bergroth.

- Color brown, with paler areas of variable extent, connexivum spotted; length 6.5–7.5 mm. *humeralis* Uhl.

3. Subfamily ACANTHOSOMATINÆ.

- Lateral angles of pronotum emarginate; posterior lateral margins depressed; orifices abruptly curved, short. 1. *Elasmucha*.
Lateral angles entire; posterior lateral margins not depressed; orifices nearly straight, longer. 2. *Elasmostethus*

1. Genus *Elasmucha* Stal.

- Color yellowish brown, mottled with reddish, variable in shade; length 7–9 mm. *lateralis* Say.

2. Genus *Elasmostethus* Fieber.

1. Antennæ black or dark brown; punctures of pronotum concolorous except along posterior margin; color pale yellowish with reddish markings; length 10 mm. **atricornis* V. D.
Antennæ pale; pronotal punctures dark. 2
2. Larger, length 10 mm.; pronotum broader and shorter; color greenish yellow with reddish markings. *cruciatus* Say.
Smaller, length 8 mm.; pronotum narrower and longer; colors as in preceding *†*cooleyi* V. D.

4. Subfamily ASOPINÆ.

Arminæ Bergr.

Cimicinæ Kirk.

1. Anterior femora armed with a spine or prominent tubercle near apex. 2
Anterior femora unarmed. 3
2. Scutellum large, broad, extending almost or quite to end of abdomen; frena not over one-third the length of the scutellum. 6. *Stiretrus*
Scutellum moderate in size, attenuated apically; frena extending to middle of scutellum 1. *Perillus*.
3. Base of abdomen armed below with a spine or tubercle. 4
Base of abdomen unarmed. 3. *Zicrona*

4. Frena extending beyond middle of scutellum; bucculae slightly elevated, disappearing posteriorly.....5
 Frena extending to middle of scutellum; bucculae distinctly elevated, not thinning out posteriorly; male with two patches of silken pubescence on the abdomen below.....2. *Mineus*
 5. Larger, length usually over 13 mm.; tylus generally shorter than juga, apex of head thus emarginate.....4. *Apateticus*
 Smaller, length usually less than 13 mm.; tylus as long as juga, apex of head thus truncate.....5. *Podisus*

1. Genus *Perillus* Stal.

Perilloides Schouteden.

- Anterior femora armed with a low conical tubercle; color entirely black, or black with red or yellowish markings; length 5-7 mm.....*exaptus* Say.
 Anterior femora armed with a more or less cylindrical blunt spine; color brown with pale yellowish markings; length 8-10 mm.....*circumcinctus* Stal.

2. Genus *Mineus* Stal.

- Color bluish black with red markings; length 8 mm.....*strigipes* H. S.

3. Genus *Zicrona* Amyot et Serville.

- Color iridescent greenish blue; length 6 mm.....*cærulea* Linn.

4. Genus *Apateticus* Dallas.

- Vaginal plate of the female genitalia triangular (fig. 8); pronotal spines shorter and less acute; anterior lateral margins of pronotum more distinctly serrulate; color brown; length 13-18 mm.....*bracteatus* Fitch.
 Vaginal plate quadrangular (fig. 9); pronotal spines longer and more acute; anterior lateral margins of pronotum very finely serrulate; color as in the preceding; length 16-20 mm.....*cynicus* Say.

5. Genus *Podisus* Herrich-Schæffer.

1. Lateral angles of pronotum blunt, projecting but little; membrane without a dark longitudinal stripe; color mottled brown; length 9-11 mm... *placidus* Uhl.
 Lateral angles distinctly projecting, more or less spine-like; membrane with a dark longitudinal stripe.....2
 2. Color usually reddish brown; basal spine of abdomen short, not extending between hind coxae; lateral angles of pronotum rather blunt.....3
 Color grayish brown; basal spine of abdomen long, extending between hind coxae; lateral angles acute; length 10-12.5 mm.....*maculiventris* Say.
 3. Smaller, length 7-8 mm.; form narrow; second antennal segment one-fourth longer than the third; color pale reddish brown.....*modestus* Dallas.
 Larger, length 8-10 mm.; form wider; second antennal segment one-third longer than the third; color darker.....*serieventris* Uhl.

6. Genus *Stiretrus* Laporte.

- Color very variable, green with white or yellowish markings in New England specimens, blue and red in various combinations in forms from other regions; length about 9 mm.....*anchorago* Fab.

A GYNANDROMORPHOUS MUTILLID FROM MONTANA.¹

BY WILLIAM M. MANN.

In July, 1912, while collecting in the Elkhorn mountains near Townsend, Montana, I found a Mutillid which presents a peculiar type of gynandromorphism. The specimen was taken with several others of the same species, which Mr. Rohwer has determined as *Dasymutilla euchroa* Cockerell. The female of this species has the body very thickly covered with long bright red hairs. The male also has these hairs on the greater part of the thorax and abdomen, and on the occipital region of the head, but the sides of the head, the epinotum, and the anterior two-thirds of the first gastric segment bear only black hairs, which are more sparse than the red ones and allow the black color of the integument to show through.

Only two gynandromorphous Mutillids have been recorded. One of these, *Mutilla europæa* L. var *obscura* Nyl., according to Wheeler (PSYCHE, Vol. XVII, 1910, p. 89), was divided laterally, the right side being female, the left male. The other example, *Pseudomethoca canadensis* Blake, which Wheeler found at Colebrook, Conn., differed in having the sexes of the two sides reversed, the female to the left. Both of these were complete, having well developed wings on the male side and even the legs of either side characteristic of the respective sex. The specimen before me is incompletely differentiated. The male side lacks wings, and all of the legs are typically male. It differs also in being a crossed or decussated gynandromorph. The head is male to the right and female to the left, while the thorax and abdomen are male to the left and female to the right. The body of *D. euchroa* is so densely covered with hairs that it is impossible clearly to make out the thoracic sutures or the sculpture. The accompanying figures will give an idea of the general outline of the body from above and the head from the front. The black parts of the insect are shaded in the figures.

¹ Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 94.

The right (male) side of the head is much shorter than the left. The right eye is larger than the other, the antennæ long and 13-jointed and the mandible short, with three teeth toward the apex. The median ocellus is perfect, though somewhat smaller than in an ordinary male. There is one lateral ocellus on the male side. On the female side the head is longer, the antennæ are shorter and 12-jointed, the eye small, located a little farther back than the other, and the mandible is much longer and more slender, with a

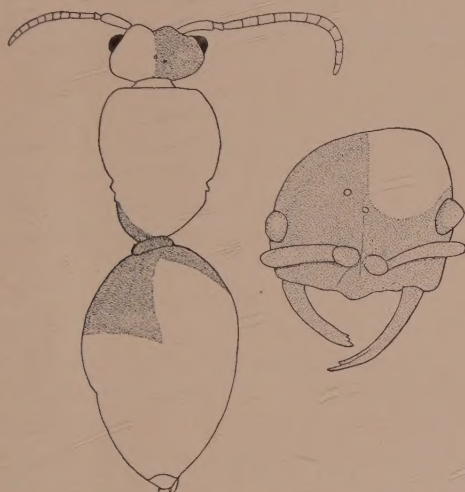


Fig. 1. *Dasymutilla euchroa* Kll., gynandromorph.

single sub-apical tooth. The pilosity of the head is black, except for spaces on the left of the occiput and front and a few scattered red hairs on the occiput to the right of the median line (the latter characteristic of the male). The clypeus, antennæ and both mandibles are black.

Each side of the thorax is not so evidently distinct from the other as in the head, because in both sexes occurs the heavy covering of red hairs. In general shape it is asymmetrical; the epinotum is more rounded on the left side and is black along the margin. The petiole is male to the left and female to the right, and is peculiarly twisted. The differences between the sides of the abdomen are more apparent. The large black spot on the left half of the first segment is typical of the male. There is a strong constriction

on this side between the first and second segments. The apical segment is only slightly twisted and from above is essentially male in character, with two well developed stipes. Anteriorly, beneath and to the right of these, is what is evidently a short, aborted sting, without any part of its sheath.

The absence of either wings or tegulæ on the otherwise gynandromorphous thorax, the queer structure of the tip of the gaster which has both of the male secondary sexual appendages and in addition an imperfect sting, and the crossed nature of the sides are very different from the conditions in either of the previously known examples.

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Florida insects of all orders, also Fish, Batrachians, Reptiles, Shells and Marine Invertebrates sold by A. G. Reynolds, Gulfport, Florida.

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The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. E. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

Wanted: Psyche, Vol. VIII, No. 265 (May, 1898); No. 267 (July, 1898); No. 268 (August, 1898); Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Wanted: Transactions American Entomological Soc., Vol. 4; Entomological News, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol. 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Insects of any order from ant nests, with specimens of the host ants, from any part of the world; also Cremastochilinae of the world. Will give cash or Coleoptera, Hymenoptera and Diptera from the United States.—Wm. M. Mann, Bussey Institution, Forest Hills, Boston, Mass.

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